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SPECIFICATION FOR ROLLED ZINC PLATE, SHEET AND STRIP

(Second Revision)

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SPECIFICATION FOR ROLLED ZINC PLATE, SHEET AND STRIP

(Second Revision)

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Indian Standard

SPECIFICATION FOR ROLLED ZINC PLATE, SHEET AND STRIP

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 12 February 1981, after the draft finalized by the Lead, Zinc, Tin, Antimony and Their Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 The earlier revision of this standard was published in 1967. As a result of experience gained during the following years, it has been decided to delete copper bearing grade of rolled zinc from this standard.

0.3 The rolled zinc specified in this standard is used for making eyelets and grommets; address plates; drawn, extruded and/or soldered battery cans; photoengravers plates; weather strips; boiler and ship plates, etc.

0.3.1 For benefit of the purchaser, an informative appendix (*see* Appendix A) giving dynamic ductility test for rolled zinc sheet and strip up to 1·25 mm thick and temper test up to 0·85 mm thick, has been included, wherever ductility and temper properties are important.

0.3.2 The grade and chemical composition of rolled zinc along with special test requirements, if any, for a specific purpose should be specified by the purchaser when making an enquiry or placing an order. The use of compositions other than those specified in this standard shall be as agreed to between the purchaser and the manufacturer.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the requirements for three grades of rolled zinc plate, sheet and strip.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Plate — Material, generally flat, of uniform specified thickness over 10 mm and width over 500 mm and cut to length.

2.2 Sheet — Material, generally flat, of uniform specified thickness over 0·15 mm up to and including 10 mm, and width over 500 mm.

2.3 Strip — Material, over 0·15 mm up to and including 10 mm in thickness and width up to and including 500 mm. It is usually supplied in coils but may be flat or folded. It is not generally cut to lengthwise.

3. GRADES

3.1 The rolled zinc plate, sheet and strip shall be of the following three grades:

Grade 1 — Generally used for drawn applications and also for address plate manufacture and photoengraver plates.

Grade 2 — Used for the weather strips, some drawn applications and soldered battery cans. When this grade is used for the latter application, that is soldered battery cans, copper is kept below 0·001 percent, *Max*.

Grade 3 — Mainly used for extruded battery cans.

4. SUPPLY OF MATERIAL

4.1 General requirements relating to the supply of rolled zinc plate, sheet and strip shall be as laid down in IS : 1387-1967*.

5. FREEDOM FROM DEFECTS

5.1 The material when supplied in the form of plate, sheet and strip shall have a clean and smooth surface free from scratches, blisters, inclusions and discolouration.

6. CHEMICAL COMPOSITION

6.1 The material, when analyzed in accordance with IS : 406-1964†, shall have the chemical composition as given in Table 1.

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*General requirements for the supply of metallurgical materials (*first revision*).

†Methods of chemical analysis of slab zinc (spelter) (*revised*).

TABLE 1 CHEMICAL COMPOSITION OF ROLLED ZINC

(*Clause* 6.1)

SL No.	CONSTITUENT	REQUIREMENT, PERCENT		
		Grade 1	Grade 2	Grade 3
(1)	(2)	(3)	(4)	(5)
i)	Lead	0·20, *Max*	0·15 to 0·60	0·80 to 1·00
ii)	Cadmium	0 10, *Max*	0·15 to 0·60	0·07, *Max*
iii)	Iron	0·010, *Max*	0 020, *Max*	0·007, *Max*
iv)	Copper	0·005, *Max*	0·005, *Max*	0·001, *Max*
v)	Zinc	Remainder	Remainder	Remainder

7. BEND TEST

7.0 Where necessary bend test on rolled zinc plate, sheet and strip shall be carried out by the method given in **7.1** to **7.3**.

7.1 Bend test specimens shall be selected by the purchaser either from shearings or from plate, sheet or strip after they have been cut to the size required or specified. Test specimens shall be cut both lengthwise and crosswise, and where practicable shall be L-shaped so as to permit of length and cross bend tests being done on the same piece. All test specimens shall be stamped with an arrow to indicate the direction of the length of the sheet.

7.2 Specimens cut both lengthwise and crosswise from sheet or strip 1·50 mm or less in thickness shall, without fracture, withstand being bent through an angle of 180° so that the internal diameter of the bend is equal to the thickness of the sheet or strip.

7.3 Specimens cut both lengthwise and crosswise from plate, sheet or strip over 1·50 mm in thickness shall, without fracture, withstand being doubled over with an included radius equal to twice the thickness of the sheet.

8. SIZES

8.1 The sizes for zinc plate, sheet and strip shall be as agreed to between the purchaser and the manufacturer.

9. TOLERANCES

9.1 The permissible variations in thickness of rolled material shall be as follows:

Material	*Thickness*	*Permissible Variation in Thickness*
	mm	
Sheet and coil cut from rolled strip	Up to and including 1·0 Over 1·0	± 0·05 mm ± 5 percent
Pack-rolled sheet and strip	Up to and including 1·0 Over 1·0	± 0·08 mm ± 8 percent
Plate	All thicknesses	+ 10 percent − 5 percent

9.1.1 Rolled zinc shall be gauged with a micrometer caliper. No two measurements along the length of the coil shall be made within 300 mm of each other, nor shall measurements in any one line across the width of the coil be used as a basis of rejection.

9.2 The permissible variations in width of rolled material shall be as follows:

Thickness		*Permissible Variation in Width*	
Over	Up to and Including	Width Up to and Including 350 mm	Width Over 350 mm
mm	mm	mm	mm
—	3·15	± 1·5	± 2
3·15	6·3	± 3	± 4
6·3	9·5	± 4	± 6
9·5	40	± 6	± 8

9.3 When the material is ordered to exact lengths, the following variations in length may be permitted:

Thickness	*Permissible Variation in Length*
mm	mm
Up to and including 12	± 3
Over 12 up to and including 40	± 6

9.4 Sidewise Bend or Curvature — The coil shall not exhibit sidewise bend or curvature in excess of 25 mm in any length of 3 m. The bend or curvature shall be determined by supporting the reel at one end of a table and drawing the strip along a 3-m straight-edge, keeping both ends of straight-edge touching the edge of the strip. No point on the straight-edge shall then be more than 25 mm from the edge of the strip.

10. SAMPLING AND CRITERIA FOR CONFORMITY

10.1 Lot — In any consignment, all boxes or crates containing zinc-plate, sheet or strip of the same chemical composition (*see* **6.1**) and made by one manufacturer shall be grouped together to constitute a lot.

10.2 From each lot, samples as specified in Table 2 shall be selected at random evenly distributed over all the boxes, cases or crates in the lot and inspected for freedom from defects (*see* **5**) and tolerance on dimensions (*see* **9**). The lot shall be considered as conforming to the corresponding requirements of this specification if the number of defectives (that is plate, sheet or strip not conforming to one or more of the requirements specified under **5** and **9**) is less than or equal to the permissible number specified in col 3 of Table 2.

TABLE 2 SAMPLE SIZE AND PERMISSIBLE NUMBER OF DEFECTIVES

Lot Size (in Number) (1)	Sample Size (2)	*Permissible Number of Defectives (3)
Up to 100	5	0
101 „ 200	15	1
201 „ 300	25	2
301 „ 500	35	3
501 and above	45	4

*This ensures that the lots containing only 4 percent or less defectives will be accepted most of the times.

10.3 Specimen material from one of the plates, sheets or strips in each lot shall be subjected to chemical analysis (*see* **6**) and where necessary also for bend test (*see* **7**).

Note — The material required for chemical analysis from each of the plates, sheets or strips intended for testing shall be collected from the ends, in accordance with IS : 1817-1961*.

10.3.1 The lot shall be considered as conforming to the requirements of chemical composition and bend test if the results of tests satisfy the corresponding requirements of this specification. If the requirements of one or both of these tests are not satisfied, two more test specimens shall be subjected to each of the tests in which the failure has occurred, in order to confirm that the testing has been done properly. If the results of both re-tests satisfy the relevant requirements, the lot shall be considered as conforming to the requirements of this specification, otherwise not.

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*Methods of sampling non-ferrous metals for chemical analysis.

11. PACKING

11.1 The material shall be packed in boxes, cases or crates so constructed as to ensure ease of handling and avoid damage during transit. When the material is supplied in coils it shall consist of not more than four pieces. No piece shall be less than 3 m in length.

12. MARKING

12.1 Each box, case or crate shall be legibly marked with the manufacturer's name, trade-mark, grade and size of the material, and gross and net weights.

12.1.1 The material may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Clause* 0.3.1)

DYNAMIC DUCTILITY AND TEMPER TESTS FOR ROLLED ZINC

A-0. The tests described in the following clauses are used in the rolled-zinc trade. The range of properties obtainable from strip and pack-rolled zinc have been given in Table 3 for information only. In the case of strip-rolled zinc properties obtainable under different conditions of temper, that is dead-soft, soft, half-hard and hard, have been given.

TABLE 3 DYNAMIC DUCTILITY AND TEMPER TEST VALUES FOR ROLLED ZINC

(*Clauses* A-0, A-1.4 *and* A-2.3.5)

THICKNESS	STRIP (RIBBON) ROLLED ZINC								PACK-ROLLED ZINC	
	Dead-Soft		Soft		Half-Hard		Hard			
	Dynamic Ductility, *Min*	Temper, *Max*	Dynamic Ductility, *Min*	Temper, *Max*	Dynamic Ductility, *Min*	Temper, *Max*	Dynamic Ductility, *Min*	Temper, *Max*	Dynamic Ductility, *Min*	Temper, *Max*
mm	mm	Percent	mm	Percent	mm	Percent	mm	Percent	mm	Percent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
0·15	7·0	70	6·5	76	5·5	80	4·2	86	4·2	88
0·20	7·1	65	6·6	72	5·6	75	4·3	83	4·3	77
0·25	7·2	60	6·7	66	5·7	70	4·4	80	4·4	73
0·30	7·4	55	6·9	62	5·8	65	4·6	77	4·6	69
0·35	7·5	52	7·0	58	6·0	61	4·7	74	4·7	65
0·40	7·6	48	7·1	54	6·1	58	4·8	72	4·8	62
0·45	7·7	46	7·2	51	6·2	54	5·0	69	5·0	58
0·50	7·9	43	7·4	48	6·4	51	5·1	68	5·1	57
0·56	8·0	41	7·5	45	6·5	48	5·2	65	5·2	55
0·60	8·1	40	7·6	43	6·6	45	5·3	63	5·3	54
0·67	8·3	39	7·7	40	6·7	43	5·5	61	5·5	52
0·71	8·4	37	6·9	37	6·9	42	5·6	59	5·6	51
0·75	8·5	37	8·0	37	7·0	42	5·7	58	5·7	49
0·80	8·6	36	8·1	36	7·1	41	5·8	57	5·8	48
0·85	8·8	36	8·3	36	7·2	40	6·0	56	6·0	47
0·90	8·8	—	8·3	—	7·4	—	6·1	—	6·1	—
0·95	8·9	—	8·3	—	7·5	—	6·2	—	6·2	—
1·00	8·9	—	3·4	—	7·6	—	6·4	—	6·4	—
1·06	8·9	—	8·4	—	7·6	—	6·4	—	6·4	—
1·12	9·0	—	8·4	—	7·7	—	6·5	—	6·5	—
1·18	9.0	—	8·4	—	7·7	—	6·5	—	6·5	—
1·25	9·0	—	8·6	—	7·9	—	6·6	—	6·6	—

A-1. DYNAMIC DUCTILITY TEST

A-1.1 Apparatus — A modified inclinable power press fitted with an adjustable die shall be used for testing. The speed of the machine shall be 85 to 90 oscillations of the plunger per minute.

A-1.2 Test Specimens

A-1.2.1 The test specimen shall be a strip about 40 mm wide made after cutting across the full width of a ribbon or sheet. When this results in a specimen less than 300 mm in length, as from narrow unslit ribbon zinc, two specimens 90 mm in width shall be cut.

A-1.2.2 Test specimens from narrow strips, such as ribbon or sheet zinc after slitting shall be cut to 500 mm lengths.

A-1.3 Procedure

A-1.3.1 The temperature of the test specimen, testing machine and room shall be kept within 21°C to 32°C throughout the test.

A-1.3.2 The specimen shall be inserted in the machine and firmly clamped. The testing shall be started from one end and the strip moved with each successive cup. The series of cups shall be along the middle line of a 90 mm strip so that clamping will be uniform around the cup as it is formed. With the motor running, the clutch shall be thrown in, lowering the plunger, which with the die in the clamp base, presses the cup in the test strip. If the cup does not show rupture, the plunger shall be advanced by increments of 0.1 mm and the cupping repeated with each increased depth until rupture occurs. Having determined the rupturing point additional cups shall be formed as a check. The rupturing point shall not be considered to be that point where an open crack is formed, but where the drawing of the bottom of the cup has just caused necking of the surface prior to rupture.

A-1.3.3 The depth of the cup at which rupture first occurs shall be read from the micrometer attachment on the plunger and reported as dynamic ductility of the specimen.

NOTE — The micrometer attachment on the plunger machanism measure the distance that plunger extends beyond the zero point. The zero point is where no impression would be made on the test strip. The clamp base is adjusted for the thickness. The micrometer attachment also serves to advance and withdraw the plunger.

A-1.4 The typical dynamic ductility test values for the strip and pack-rolled zinc are given in Table 3.

A-2. TEMPER TEST

A-2.1 Test Specimens — Duplicate test specimens shall be cut from each sample and shall be rectangular in shape and cut accurately to 30 mm in width and 120 mm in length with the length taken in the direction of rolling. With ribbon zinc the duplicate test specimens shall be cut from adjacent places across the width of sample.

A-2.2 Procedure

A-2.2.1 The temperature of the test specimen, testing machine and room shall be kept within 21°C to 32°C throughout the test.

A-2.2.2 The specimen shall be inserted to the full depth of the vice of the mandrel and securely held by tightening the vice. The diameter of the mandrel is 63 mm. Inserting the test specimen as specified to the full depth of the vice leaves extended a length exactly one-half the circumference of the mandrel. In the rotation of the mandrel, the test specimen is pressed by the contact arm against the mandrel. When the outer or free end passes the contact arm, it springs out according to its temper. The speed of the rotation of the mandrel shall be between 50 to 55 rev/min. With the motor running, the clutch shall be thrown in, rotating the mandrel counter-clock-wise. When the outer end of the test specimen has passed the contact arm, the rotation of the mandrel shall be stopped by throwing out the clutch. The mandrel shall turn to the 100 percent position which is indicated by a mark on the mandrel and the fixed pointer, and the percentage of temper shall be read from the position of the outer end of the specimen on the underlying graduated scale, consisting of a semicircle graduated counter-clockwise from 0 to 100 percent.

A-2.2.3 The duplicate specimen shall be similarly tested and in order to eliminate the effect of the curvature of the test specimen due to coiling, shall be inserted in the vice in the reverse position to that of first specimen. That is, if one specimen is inserted and pressed with its curvature towards the mandrel, the duplicate specimen should be inserted with its curvature away from the mandrel.

A-2.2.4 The average of the readings on the two test specimens, shall be reported as the temper of the material.

A-2.2.5 The typical temper test results for the strip-and pack-rolled zinc are as given in Table 3.

INDIAN STANDARDS
ON
LEAD, ZINC, TIN, ANTIMONY AND THEIR ALLOYS

IS:

25-1979	Antifriction bearing alloys (*third revision*)
26-1979	Tin ingot (*third revision*)
193-1977	Soft solder (*third revision*)
209-1979	Zinc (*third revision*)
211-1977	Antimony (*third revision*)
404 (Part I)-1977	Lead pipes: Part I For other than chemical purposes (*second revision*)
404 (Part II)-1979	Lead pipes: Part II For chemical purposes (*second revision*)
405 (Part I)-1977	Lead sheet and strip: Part I For chemical industries (*second revision*)
405 (Part II)-1977	Lead sheet and strip: Part II For other than chemical purposes (*second revision*)
713-1981	Zinc base alloy ingots for die casting (*second revision*)
742-1981	Zinc base alloy die castings (*second revision*)
1339-1977	Lead and lead alloys for sheathing of electric cables (*second revision*)
1357-1977	Printing type metal ingots (*second revision*)
1654-1977	Lead antimony alloys (*second revision*)
1655-1968	Code of practice for manufacture of zinc alloy pressure die castings (*first revision*)
1921-1975	Rosin-cored solder wire (*first revision*)
2258-1981	Rolled zinc plate, sheet and strip (*second revision*)
3717-1977	Refined secondary lead (*first revision*)
4280-1979	Refined secondary tin (*first revision*)
4699-1968	Refined secondary zinc
5479-1969	Solders for jointing aluminium alloys
6344-1971	Cadmium metal
8439-1977	Methods for sampling of lead and lead alloys
8475-1977	Lead-base antifriction bearing alloy for heavy duty applications

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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